REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in view of the following remarks is respectfully requested.

Claims 1-7, 18-20, 24, 25, and 28-33 are presently active in this case. Claims 1, 24, and 25 have been amended and claims 28-33 have been added by way of the present amendment.

In the outstanding office action, claim 1 was rejected under 35 USC 103(a) as being unpatentable over Japanese Publication No. 11-345780 or U.S. Patent No. 6,250,251 to Akiyama et al.; claims 1-4, 6, and 7 were rejected under 35 USC 103(a) as being unpatentable over Akiyama et al. in view of Japanese Patent Publication No. 09-272965 to Michio et al.; claim 5 was rejected under 35 USC 103(a) as being unpatentable over Akiyama et al. in view of Michio et al. and U.S. Patent No. 6,235,120 to Bang et al.; and claims 18-20, 24, and 25 were rejected under 35 USC 103(a) as being unpatentable over Michio et al. in view of Akiyama et al.

A component of a vacuum deposition apparatus as defined by claim 1 includes a spray deposit coated on a surface of a component body. A target apparatus defined by claim 24 includes a spray deposit coated on a non-erosion area of a target body. Finally, a target apparatus defined by claim 25 includes a spray deposit coated on a surface of a backing plate body which holds the target.

The present invention is characterized in that the spray deposit has a surface roughness in which a mean spacing S of tops of local peaks of profile is in a range from 50 to 150 μm, a distance from a mean line to a bottom of profile valley line Rv is in a range from 20 to 70 μm, and a distance from a mean line to a top of profile peak line Rp is in a range from 20 to 70 μm. A difference in distance between the top of profile peak line Rp and the

bottom of profile valley line Rv (Rp - Rv) is in a range from -11 to 6 μm so that a film adhered on the surface of the spray deposit grows with a stable columnar structure.

In the present invention, the surface roughness of the spray deposit is provided by the mean spacing S of tops of local peaks of profile, the distance from the mean line to the bottom of profile valley line Rv (the bottom distance Rv), and the distance from the mean line to the top of profile peak line Rp (the top distance Rp). Unevenness on the surface of the spray deposit can be made uniform by controlling both the bottom distance Rv and the top distance Rp. Consequently, the difference in distance between the top of profile peak line Rp and the bottom of profile valley line Rv (Rp - Rv) can be reduced.

When the value of (Rp - Rv) is small, an unevenness on the surface of the spray deposit obtains a uniform condition as shown in the attached figure 1. According to the present invention, such a surface condition is prescribed by the value of (Rp-Rv) = (-11 μm to 6 μm). As a consequence of setting (Rp-Rv) in this range, the film adhered on the spray deposit grows with stability. Furthermore, by stably growing the adhered film, the tendency of the particles from the adhered film to peel and fall may be largely suppressed.

In summary, the adhered film grows regularly on the spray deposit when the value of (Rp - Rv) is in the range from -11 to 6 μm. That is, the film adhered on the spray deposit grows with a stable columnar structure. Hence, the falling and the peeling of the adhered film may be largely suppressed and the number of particles can be drastically reduced.

In contradistinction thereto, when the (Rp - Rv) value of the spray deposit exceeds 6 μm, large peak portions exist on the surface of the spray deposit. When large peak portions exist on the surface of the spray deposit, the adhered film intensively piles up on the large peak portions. Therefore, the adhered film grows non-uniformally. When the adhered film grows non-uniformally, hollows and cracks readily occur in the adhered film. Consequently, particles from the adhered film peel and fall.

When the (Rp - Rv) value of the spray deposit is less than -11 μm, deep valley portions exist on the surface of the spray deposit. In such a case, pores occur in the deep valley portions. Therefore, the adhered film grows non-uniformally. Consequently, particles from the adhered film peel and fall.

Experimental data regarding the relationship between the (Rp - Rv) value of the spray deposit and the number of particles is shown in the attached table 1. The experimental data shown in the attached table 1 is based on the following condition. The components of the sputtering apparatus is prepared by coating an Al spray deposit and a Ti spray deposit on the SUS 304 substrate according to the conditions of Embodiment 1 of the instant specification. The surface roughness of the spray deposit (Ti spray deposit) is controlled by the spraying conditions and the cleaning treatment conditions after spraying. The surface roughness of the component is shown in attached table 1.

The sputtering apparatus is configured with the components shown in the attached table 1. In the sputtering apparatus, Ti thin film and TiN thin film are deposited on the 8-inch wafer according to the conditions of Embodiment 1 of the instant specification. The number of particles having a diameter of 0.2 μm or more on the obtained Ti/TiN thin film is measured. Furthermore, the thin film deposition process is continued. In terms of the number of lots where the number of the particles increases sharply, an evaluation is made of the life span until the peeling of the spray deposit is observed. The number of the particles and the peeling life of the spray deposit are shown in the attached table 1.

The samples of Nos. 1 - 17 in the attached table 1 are equivalent to the components of the present invention. As you can see from the table, (Rp - Rv) for sample Nos. 1-17 is less than 6 μm and greater than -11 μm. Hence, the number of the particles is small, and the fabrication yield of Ti/TiN thin film increases. Furthermore, the peeling life of the spray deposit is long, resulting in longer and stable use.

On the other hand, the (Rp - Rv) value of sample of Nos. 18-26 exceed the range of the present invention. Sample of Nos. 18-26 represent the components where the (Rp - Rv) value is more than 6 μm, or less than -11 μm. Samples of Nos. 18-26 are Comparative Examples. These examples reflect that a number of the particles is large and that the peeling life of the spray deposit is short.

It is apparent from table 1 that the present invention stably and effectively suppresses the tendency of particles to fall from adhered film and to peel therefrom based on the value of (Rp - Rv) being in the range from -11 to 6 μm. Furthermore, a spray deposit having the surface condition provided by the present invention is easily manufactured.

Akiyama et al. (Japanese publication No. 11-345780 or U.S. Pat. 6,250,251) disclose a vacuum deposition apparatus having a member of which surface roughness is provided by "ten-point means roughness Rz" and "a mean interval S of local ridges." As shown in Fig. 4 of Akiyama et al. and the attached figure 2 of this amendment, ten-point means roughness Rz is "the means of the distance of the peak portions and the distance of the valley portions," and does not prescribe each form of the peak portions and the valley portions of the profile. Even if ten-point means roughness Rz is in the range from 5 to 200 μm, the bottom distance Rv and the top distance Rp is not always in the range from 5 to 200 μm.

The peak portions and the valley portions can take various forms even if ten-point means roughness Rz is constant. Examples are shown in the attached figures 3(A) - 3(C). Though the attached figure 3 shows one peak portion and one valley portion for simplification, ten-point means roughness Rz is the mean of the distance of the peak portions and the distance of the valley portions. Hence, the value of (Rp - Rv) is not the same as ten-point means roughness Rz.

The attached figure 3(B) illustrates the scenario where (Rp - Rv) is zero and hence reflects the (Rp-Rv) values of the present invention. Even if the profile illustrated in Figure

3(A) has a ten-point means roughness Rz which is equal to the attached figure 3(B), there is a case that the distance of the peak portion is large as shown in the attached figure 3(A). In the same way, there is a case that a distance of the valley portion can be deep as shown in the attached figure 3(C). In the attached figure 3(A), the distance of the peak portion is large and the distance of the valley portion is small. As a result, the ten-point means roughness Rz of the attached figure 3(A) equals that of the attached figure 3(B). As for the attached figure 3(C), that figure illustrates the reverse.

The Akiyama et al. patent and Japanese publication include all of the conditions shown in the attached figures 3(A) and 3(C), because surface roughness is provided by Akiyama et al. only by the ten-point means roughness Rz. In the attached figure 3(A), the adhered film is intensively piled up on the big peak portions resulting in non-uniform growth. In the attached figure 3(C), pores occur in the deep valley portions, resulting in the adhered film growing non-uniformly. Attached figures 3(A) and 3(C) also illustrate that the adhered films do not grow with a stable columnar structure. This point is clear from the experimental data.

Thus, Akiyama et al. only disclose a member of which surface roughness is provided by "ten-point means roughness RV," and do not show that the distances of the peak portions and the valley portions are controlled. Further, Akiyama et al. do not disclose or suggest that a difference in distance between the top of profile peak line Rp and the bottom of profile valley line Rv (Rp - Rv) is made small, (in a range from -11 to 6 μm) so that a film adhered on the surface of the spray deposit grows with a stable columnar structure.

Moreover, the subject matter described by Akiyama et al. is patentably distinct from that of the present invention in the method for providing the surface roughness, the form provided on the surface, and in the motivation provided. That is, in Akiyama et al., "the peeling of the film is prevented by enlarging the roughness of the surface of the member as

much as possible and extending the touch area of the member and the film." It is described in Akiyama et al. that enlarging Rz as much as possible improves membranous adhesion.

Furthermore, in Akiyama et al., Rz is controlled by roughing the surface of the member by blasting (Example 1). In the present invention, the value of (Rp - Rv) is controlled by coating the spray deposit on the surface of the component body. Hence, Akiyama et al. do not teach or suggest that the spray deposit is easily provided on a surface of which the value of (Rp - Rv) is small (from -11 to 6 μm).

Finally, Akiyama et al. do not teach or suggest the characteristic structure of the present invention. That is, Akiyama et al. do not teach or suggest a spray deposit having surface roughness wherein a difference in distance between the top of profile peak line Rp and the bottom of profile valley line Rv (Rp - Rv) is in a range from -11 to 6 μm so that a film adhered on the surface of the spray deposit grows with a stable columnar structure. Furthermore, Akiyama et al. do not disclose or suggest the technology that controls the form of the peak portions (Rp) and the valley portions (Rv) and hence the value of (Rp - Rv). Therefore, it is believed that the subject matter of the present invention would not have been anticipated or rendered obvious by Akiyama et al.

Claims 2 - 7, 18 - 19, 24 - 25, and 28 - 33 are believed to be allowable for at least the same reasons that claim 1 is believed to be allowable. Consequently, no further issues are believed to remain. An early and favorable action is respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

W. Todd Baker

Eckhard H. Kuesters
Attorney of Record
Registration No. 28,870
W. Todd Baker
Registration No. 45,265

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
EHK:WTB\la

I:\ATTY\WTB\0039\212835US\AMENDMENT 14 JAN 04.DOC